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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/468,206	12/20/1999	TAKESHI FUJITA	09743/019001	3356

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EXAMINER	
GRAHAM, ANDREW R	

ART UNIT	PAPER NUMBER
2644	12

DATE MAILED: 04/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/468,206	FUJITA, TAKESHI	
	Examiner	Art Unit	
	Andrew Graham	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The applicant's response submitted January 8, 2004 regarding the objections made to the specification in the previous office action has been found persuasive. Accordingly, said objections are hereby withdrawn.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. The applicant's amendments submitted January 8, 2004 regarding the rejections made to Claims 7-10 in the previous office action has been considered and approved. Accordingly, said rejections are hereby withdrawn.

3. However, **Claims 6, 9, and 10** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 recites the limitation "the polyhedron" in the ninth line of the claim. There is insufficient antecedent basis for this

limitation in the claim, as the loudspeaker body is designated as having a spherical shape in the third line of the claim. The applicant is respectfully requested to amend said claim language in regards to this spherical shape, including references to the apex positions between two speakers.

Claims 9 and 10 are rejected due to their respective dependencies upon Claim 6.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claims 1, 2, 5-11, and 14** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujita et al (USPN 5812685) in view of Davis (USPN 4503553). Hereafter, "Fujita et al" will simply be referred to as "Fujita".

Fujita discloses an omnidirectional speaker arrangement with multiple, variously positioned directional speakers. Figure 1 illustrates one embodiment in which 32 full range speaker units (78) are positioned on the 32 outside surfaces of a polygon-shaped enclosure (col. 7, lines 9-14). The processing circuitry connected to the driver of each speaker unit involves a digital signal processor

(6) that prevents distortion in the output of the overall speaker system by altering the phase and frequency response of the individual units (col. 6, lines 26-36). Fujita states that DSP (6) applies FIR filters or a combination of FIR and IIR filters to the digital input signals applied to either the full range (78) or multiway (7,8) speakers of the system (col. 6, lines 26-36). The overall device reads on "A loudspeaker system having wide-directional characteristics". The enclosure (EC) of the shown embodiments reads on "a loudspeaker body having a polyhedron shape". The speakers (78) read on "a plurality of speakers disposed on outer peripheral surfaces of the loudspeaker body". The processing of the DSP (6) for correcting the speaker characteristics such as the dip (5) shown in the response pattern of Figure 4 reads on "a correction filter operatively connected to the speakers and increasing sound pressures in relation to increasing sound frequencies to flatten sound pressures".

However, the teachings of Fujita do not particularly specify:

- an angular relationship between the axial lines of the speakers in the system
- a position between two speakers for which the sound pressure is increased in order to flatten the sound pressure in regards to the sound frequency

Davis discloses a signal processing system with many audio and operational benefits. One of these benefits is circuitry for

obtaining a flat frequency response in the on-axis as well as off-axis directions (col. 8, lines 29-68). In providing background information about directional audio in terms of frequency, Davis teaches that low frequency sounds, those at 20 Hz are substantially omnidirectional and become less so, to approximately half omnidirectional as they approach 500 to 600 Hz (col. 1, lines 59-67). Davis also teaches that this directionality increases as the frequency increases, with high frequency sounds, those from 8KHz to 20 KHz being more closely unidirectional (col. 1, lines 67-68 an col. 2, lines 1-2). Figures 3 and 4 illustrate the increasingly directional patterns of increasing frequency ranges of sound (col. 7, lines 1-15). Figure 11 illustrates these directional patterns in a multi-speaker arrangement. The patterns shown in Figure 11 are of the high frequency ranges, with six speakers being arranged approximately 60 degrees around the center axis of the speaker (col. 8, lines 37-44). As can be seen in the figure, the directionality of the individual speakers creates intermediate zones of sound, with the spaces located most remotely from either axis of adjacent speakers receiving no sound of the particular emitted frequency. The invention of Davis, however, is able to vary the amplitude and phase of adjacent drivers as a function of the frequency of the driving signals in order to create an omnidirectional frequency pattern (44) (col. 8, lines 37-62). This same signal manipulation is performed on all output frequencies (col. 8, lines 62-68). The components used in deriving and adjusting the signals applied to the speakers of the system are illustrated in

Figures 15A-15C. The regular arrangement of the involved speakers reads on "a manner that axial lines of adjacent two speakers intersect each other at a predetermined angle". The shaping of the dispersion pattern into omnidirectional from multiple directional patterns reads on "increasing sound pressures in relation to increasing sound frequencies to flatten the sound pressures at a position existing on a line extending straight from a center of the polyhedron toward an outside of a polyhedron via an apex position of the adjacent two speakers". The improvements illustrated in Figures 11 and 12 particularly read on "wherein at the position an average attenuation in sound pressures versus the increasing sound frequencies from about 500 Hz and greater is maximum without the correction filter".

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to alter the drive signals applied to the speakers of the system of Fujita in the manner detailed by Davis. The motivation behind such a modification would have been that the teachings of Davis would have enabled a frequency based modification of the collective diffusion pattern of the speakers. Davis also gives an analog version of the circuitry used in modifying the phase and amplitude of the input signal, which would have been less complex and potentially less power consuming that the analog-to-digital converting and digital signal processing. It is noted that the DSP of Fujita involves the same filtering program run on both of the full range or multiway speaker arrangements.

Regarding **Claim 2,** Fujita discloses that regular dodecahedron and

regular icosahedron may be used in the speaker system of the disclosed invention, even though a 32-sided embodiment is preferred (col. 5, lines 34-42). This teaching reads on "said loudspeaker body has a regular polyhedron shape having a plurality of outer surfaces on which said speakers are arranged respectively". It is further noted that dodecahedrons are a shape that is well-known in the art of omnidirectional sound production.

Regarding **Claim 5**, the phase and amplitude control networks for modifying the radiation dispersion patters are shown in Figures 15A-15C, and as can be seen, each include a plurality of capacitors, resistor, and inductors (col. 10, lines 18-68 and col. 11, lines 1-58). An all pass filter comprising a pair of resistors (130,138) and capacitors (132,144) is particularly noted in one embodiment for shaping signals of particular frequencies (col. 12, lines 45-57). These teachings, in view of the analog version of signal shaping proposed by Davis, reads on "said correction filter includes at least two resistors and two capacitors which are operatively connected.

Regarding **Claim 6**, please refer to the like teachings of Claim 1, noting the spherical frame shown in Figure 5 of Fujita(col. 7, lines 41-49).

Regarding **Claim 7**, please refer to the like teachings Claim 1, noting that Davis specifically teaches that emitted sound is approximately half omnidirectional at 500 or 600 Hz, becoming more unidirectional as the frequency increases, and that the processed diffusion pattern is omnidirectional at the given frequencies with the

signal shaping circuitry in place.

Regarding **Claim 8**, Figures 11 and 12 illustrate that the sound diffusion pattern maintains it flatness on the axis of each of the involved speakers (col. 8, lines 57-62). As the response is detailed as being flat in any direction, this reads on "characteristics of the speakers are set to maintain the flatness of the sound pressures at a position outside each speaker along an axial line of each speaker without the correction filter" (col. 8, lines 29-33).

Regarding **Claim 9**, please refer to the like teachings of Claim 7. Regarding **Claim 10**, please refer to the like teachings of Claim 8.

Regarding **Claim 11**, please refer to the like teachings of Claim 1 regarding the "loudspeaker body" and "plurality of speakers" and the same limitations of the "correction filter" included in the system. Regarding the "correction value according to an attenuation factor", the frequency response pattern is taught by Davis as being adjustable based on the phase and amplitude of the signal driven by the speakers in the system (col. 8, lines 57-68). Davis specifically mentions that the variously angled speakers may be adjusted to emit a substantially round, uniform output pattern, enabling the areas between the on-axis regions of the speakers to obtain frequencies of the output signal where the particular frequency ranges would otherwise be attenuated. This flattening or evening of the sound field reads on "setting a correction value according to an attenuation factor based upon the predetermined angle to flatten sound pressures".

Regarding **Claim 14**, Fujita discloses that signal shaping

circuitry may be used in correcting the sound of a full range type speaker (col. 6, lines 5-8). The signal-shaping teachings of Davis are based on the properties of the frequencies of the sound being emitted (col. 1, lines 47-68 and col. 2, lines 1-2). It is further noted that single cone speakers are well known in the art, along with the various associated operating characteristics. Collectively, these teachings read on "each speaker is a single cone full range unit speaker".

5. **Claims 3, 4, 12, and 13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujita in view of Davis, as applied above, and further view of well known prior art (MPEP 2144.03).

As detailed above, Fujita discloses embodiments and processing for various polygon shaped speaker systems, including a dodecahedron, and Davis discloses processing circuitry for ensuring an even frequency response for the entire range of frequencies emitted by a speaker system.

Regarding **Claim 3**, the details of a regular dodecahedron shaped speaker system are discussed in regards to Claim 2.

As per the specifics of the speaker connections though, Fujita in view of Davis does not specify:

- that the speakers are separated into three sets, wherein one of the speaker groups includes four speakers connected in series.

However, Examiner takes Official Notice that the nature of the

electrical connections and the properties of elements connected in series and in parallel would have made the connection of the speakers in variously sized groups an obvious and desirable modification. Connecting a group of resistances, which in regards to the current system, said resistances would be the resistances of the speakers, the most simple arrangement and the one with the fewest number of connections would have been the connection of each of the resistances in series. From the basic electrical laws though, resistances in parallel have a lower combined overall resistance than resistances in series (series = R1 + R2, but parallel = (R1*R2)/(R1+R2)), and thus draw less overall current and require less operating power from the same voltage supply (noting that current total = voltage/resistance total). Thus, in optimizing the system for simplicity as well as efficiency, the electrical properties of a preferred embodiment would have consisted of groups of speakers in series instead of all of the speakers in series. To promote uniform operation of the speakers - especially in a system attempting to create flat, balanced sound pressured, the groups would have needed to comprise an equal number of speakers. With twelve speakers then, this would have left the option of having six groups of two speakers, four groups of three speakers, three groups of four speakers, two groups of six speakers, and twelve groups each with one speaker, noting again that group here is defined as a set of speakers in series. Thus, the third of the possible groups listed above reads on "three sets of speaker groups connected in parallel to each other, one of three sets of speaker groups

including four speakers connected in series.

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to connect the speakers in the system of Fujita in view of Davis in three groups with one of the groups comprising four speakers in series. As detailed above, the motivation behind such a modification would have been the improved tradeoffs between the simplicity of such a connection and the decrease in the amount of current passing through the speaker resistances and the overall amount required by the system.

Regarding **Claim 4**, please refer to the like teachings of Claim 3. Regarding **Claim 12**, please refer to the like teachings of Claim 3. Regarding **Claim 13**, please refer to the like teachings of Claim 4.

Response to Arguments

Applicant's arguments with respect to claims 1-14 have been considered but are moot in view of the new ground(s) of rejection. Please particularly note that shaping of the sound in the teachings of Davis is based on the properties of the frequency of the emitted sound, and that Fujita et al discloses the use of full range or multiway speakers in forming an omnidirectional sound source.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham

whose telephone number is 703-308-6729. The examiner can normally be reached on Monday-Friday, 8:30 AM to 5:00 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Isen can be reached on (703)305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AG

Andrew Graham
Examiner
A.U. 2644

ag
April 5, 2004

MINSUN CH HARVEY
PRIMARY EXAMINER